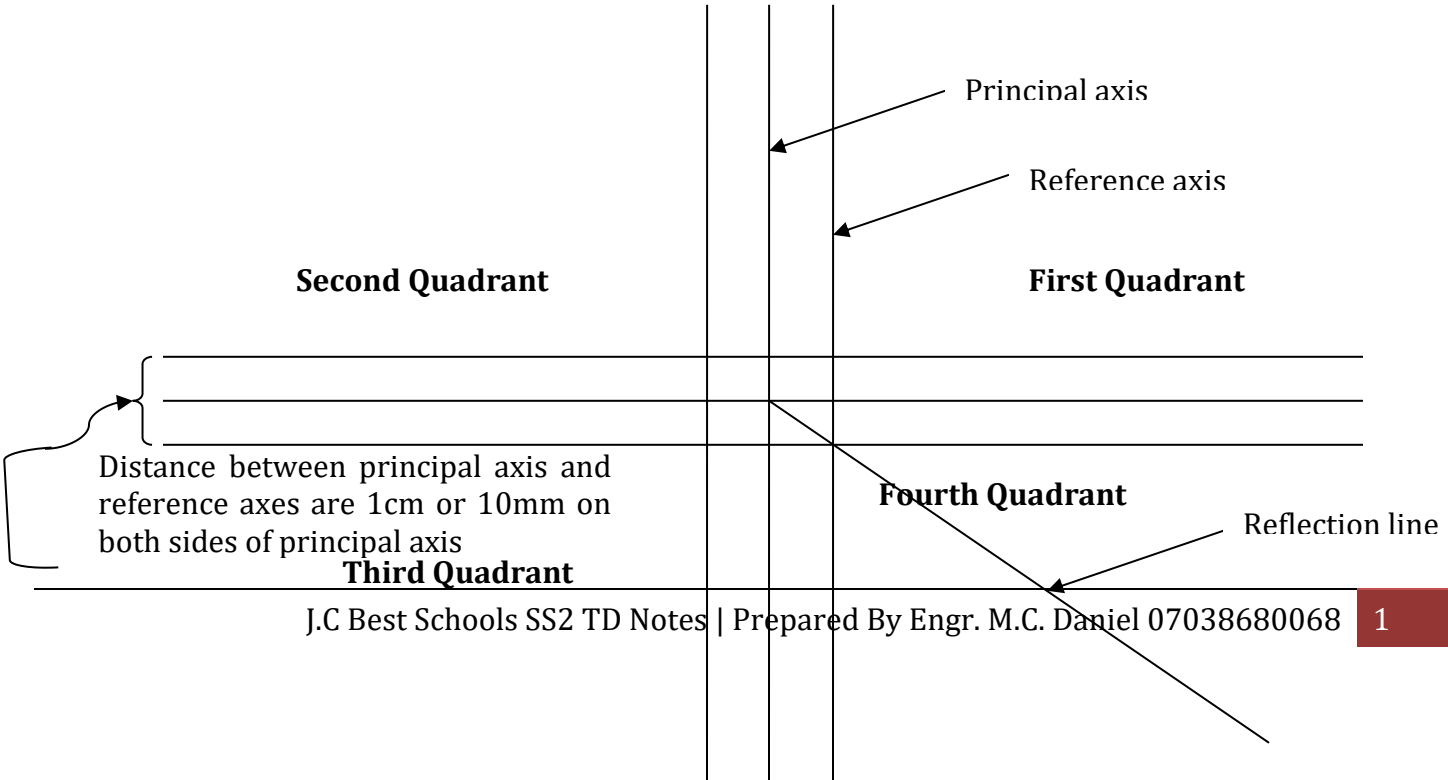
3rd Term SS2 Technical Drawing Lesson Notes
Week One Topic: Orthographic Drawing
Sub-Topics: Definition. Introduction. Orthographic axis. Types of Angles used during projection.

Definition. **Orthographic drawing** is the method of drawing whereby an object is presented in 2-dimensional format, which allows the true lengths, hidden parts and true shape of the object to be seen. Another form of orthographic drawing is **working** or **manufacturing drawing**. This is because it contains all the details that a manufacturer needs to produce the object that was drawn.
Introduction. **Orthographic drawing** is the only drawing type used in technical drawing that allows a technician to see all the drawing details in an object. It does this by placing three faces of the object on a drawing sheet. These faces are gotten by looking at the object from three positions or locations namely: Front of the object called **Front View (FV)** also known as **Front Elevation (FE)**. Looking from the Sides (right side or left side) of the object is called **End View (EV)** or **Side View (SV)**. Then, the object can be looked at from the top and it's known as **Plan View (PV)**. But the commonly used name for this **Plan View** is **Plan Top (PT)**. This is because it is impossible for one to look at a big object like a house, bridge, vehicles, etc. from under it. So, the look is only done from the top.
Orthographic Axis. Orthographic drawing makes used of certain axes. There are mainly three of them, namely: **The principal axis, the references lines,** and the **reflection line**. There are two principal axes and they cross each other at 90^0. Each of the principal axes has two references lines on both sides of them. The reference lines are 1cm or 10mm away from each of the principal axes. The body of the object being drawn on these axes can only touch some of the four reference lines drawn by the sides of the two principal axes. The axes are drawn to divide the drawing sheet into four quadrants that are not always equal in space. Even though the four quadrants can have equal spaces, the spaces are determined by the size and shape of the object that is to be drawn.
The reflection line is one. It is placed on the quadrant where none of the faces or views of the object will occupy. It is drawn by starting at the point where the two principal axes cross each other, passing it through one of the four points where the four reference lines cross each other, and then extending it to whatever distance the technician wants. The length of the reflection line must cross all the lines that will later be drawn to connect the faces or views with each other. The angle between the reflection line and the reference lines is 45^0. The diagram below explains all these details in one whole swoop.

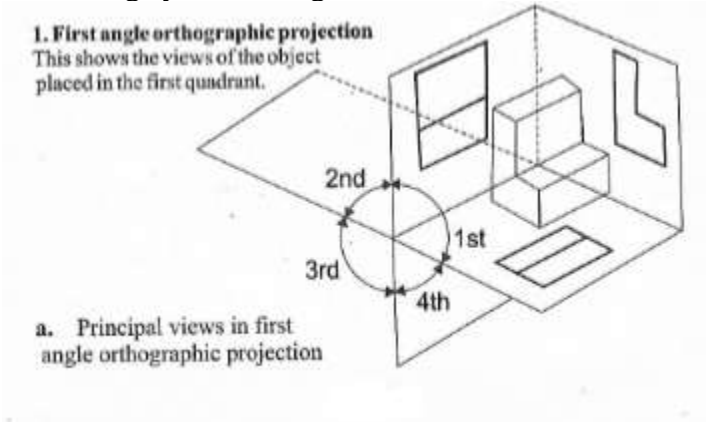


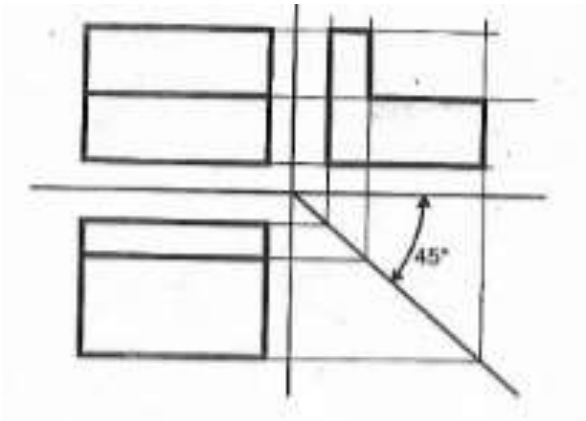
Angles used in orthographic drawing. There are two angles that are known to technicians, which are used in presenting the views of an object. These angles are **First Angle** and **Third Angle** projections. The **first** and **third** tags used above come from any of the quadrants where the **Front View** is placed. Second and fourth are not used because the type of drawing presentation that **First Angle** gives is the same that **Second Angle** gives. In the same way, **Third** and **Fourth Angles** give the same type of drawing arrangement. This is the reason why the **Second** and **Fourth Angles** are not mentioned at all. The rules followed to carry out this drawing type make all these things possible.

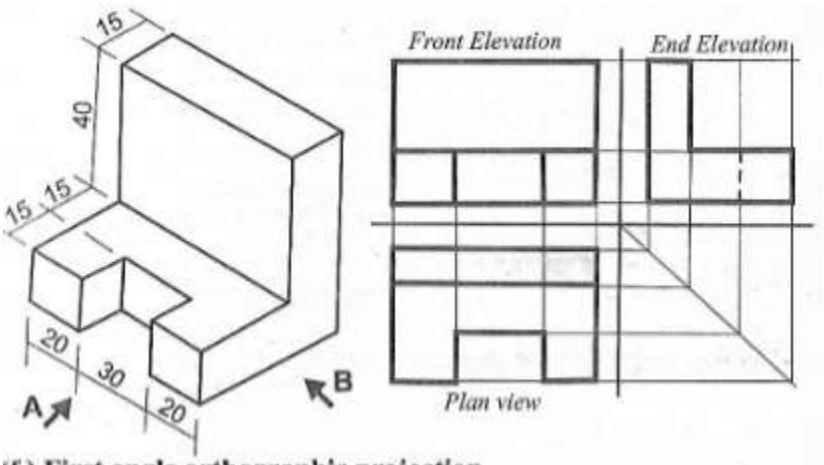
<u>The rules for placement of view in O.P. axis</u>

Rules for First Angle Projection:

1. The main face of the object that the eye looks at first is normally called the **Front View** or **Front Elevation**. The shape or nature of the **Front View** that eye sees is placed on the **First Quadrant** or **Second Quadrant** to produce the same type of drawing placement.
2. The **Side Views** are placed either to the **left** or to the **right sides** of the **Front Elevation**. How this is done is that, you look at, for instance, the **left** side of the object. Whatever shape or form you see, you draw it on the **right** side of the object. And the main object here is represented by the **Front View**, which you had drawn.
3. In the same way, if you look at the object from the **left** side, you draw what you see on the **right** side of the **Front View**.
4. The same method is applied when presenting the **Plan Top** on the paper. What the eye sees after looking at the object from the top is placed below the **Front View**.
5. Hence, the idea here is that in **First Angle** projection, what the eye sees once it had looked at an object is placed on the other side of the object, and not on the same side the looking is positioned to look at the object. This means that the **Front View** stands between the **End View** and the looking eye. The diagrams below illustrate this.

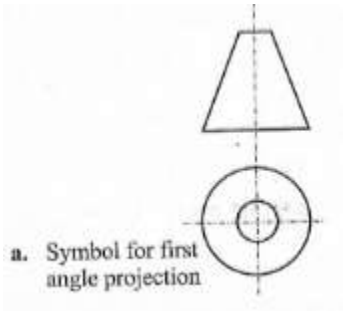






(f) First angle orthographic projection

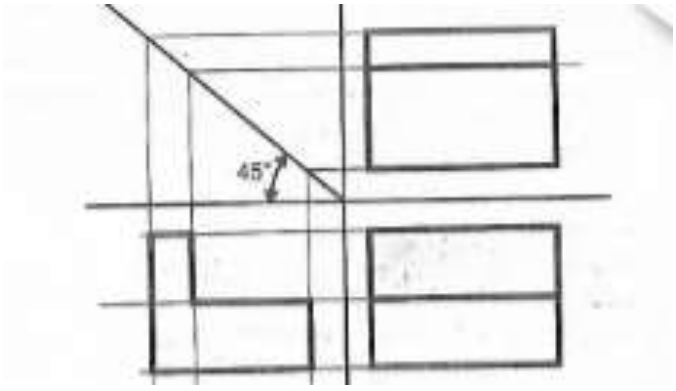
The symbol used to tell any technician that drawing he or she is seeing is a First Angle projection is shown below.



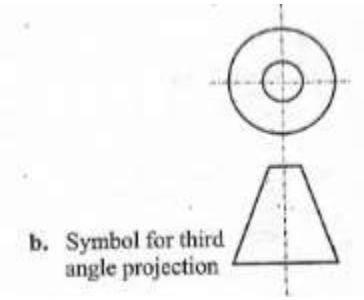
a. Symbol for first angle projection

Rules for Third Angle Projection:

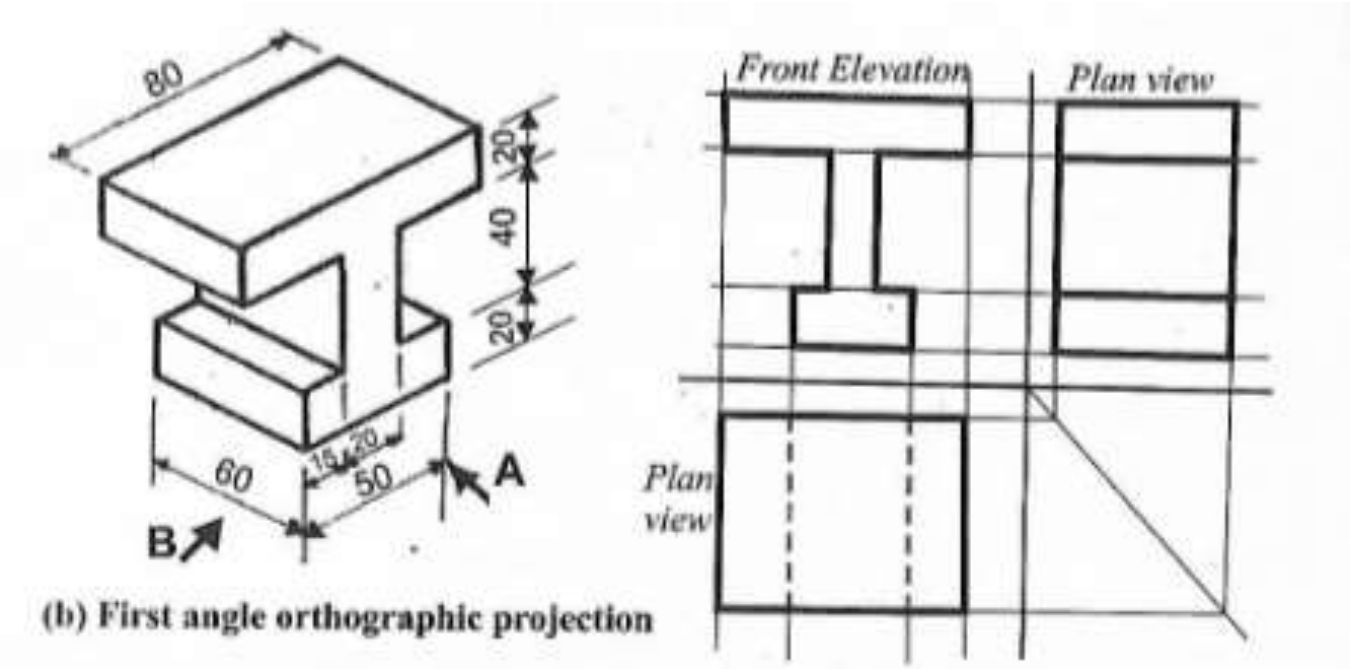
The rules stated above are the same and applicable to **Third Angle** projection. The only difference is that the **Front View** or **Elevation** in **Third Angle** is placed on the **Third** or **Fourth Quadrant**. But the nature or shape of the object remains the same. In this case, the **End View** is placed between the looking eye and the **Front View**. This is because the rule stipulates that whatever the eye sees should be placed in front of the eye, somehow between the eye and the **Front View** and the looking eye. The diagram below shows to us what will be the result when the faces of the object above are presented in **Third Angle** projection.

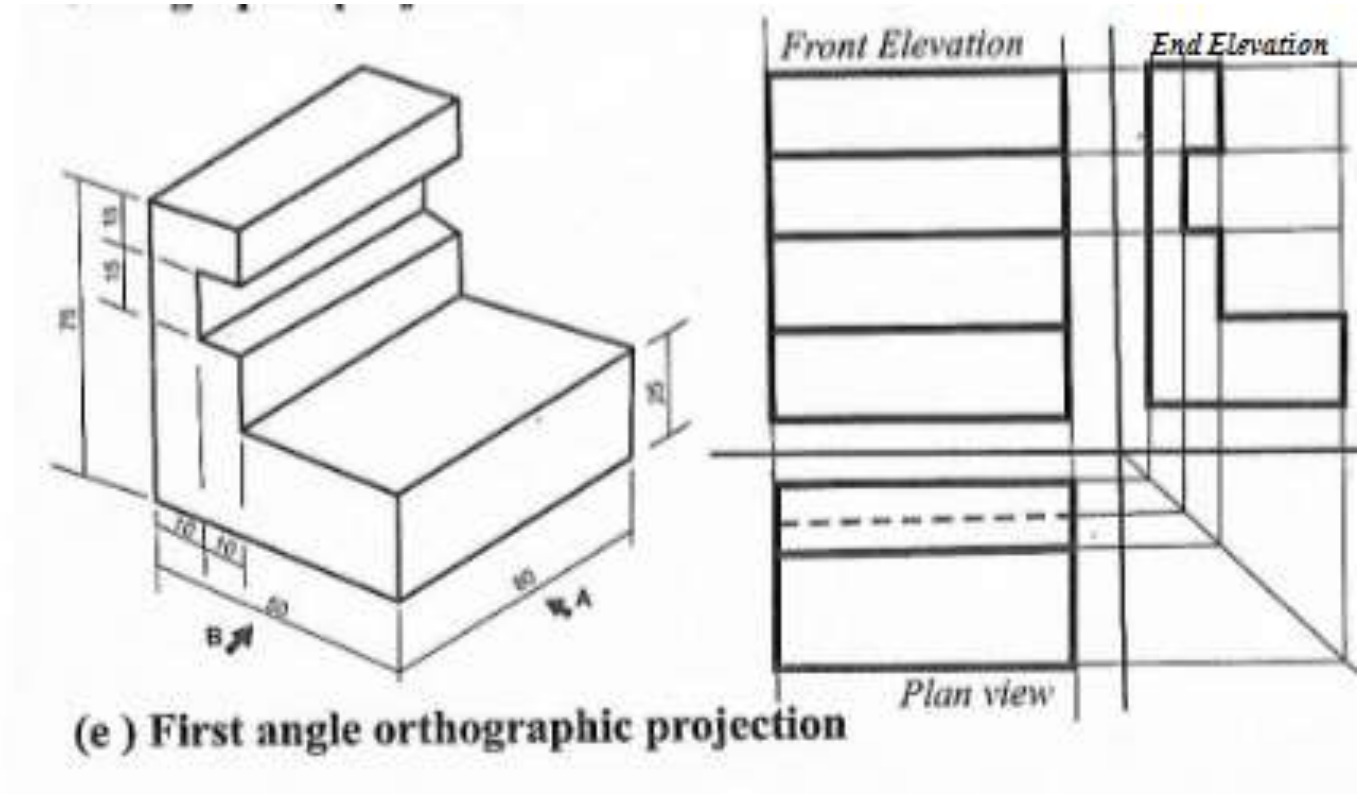


Below is the symbol used to identify **Third Angle** drawings.



Week Two Topic: Orthographic Drawing
Sub-Topics: Projecting Simple Objects in First Angle



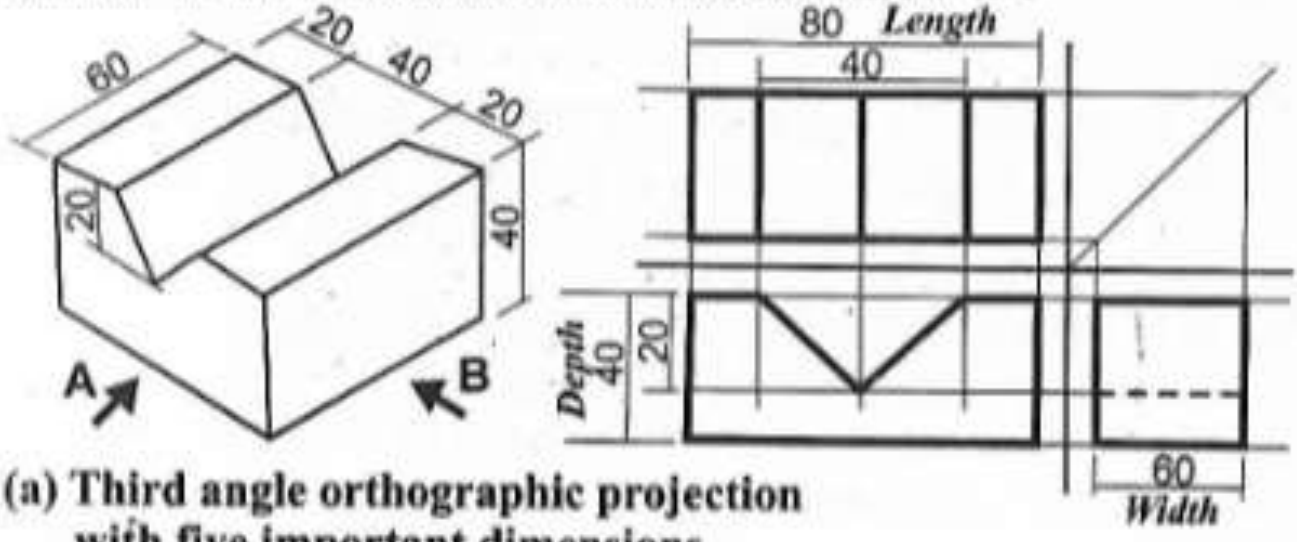


(e) First angle orthographic projection

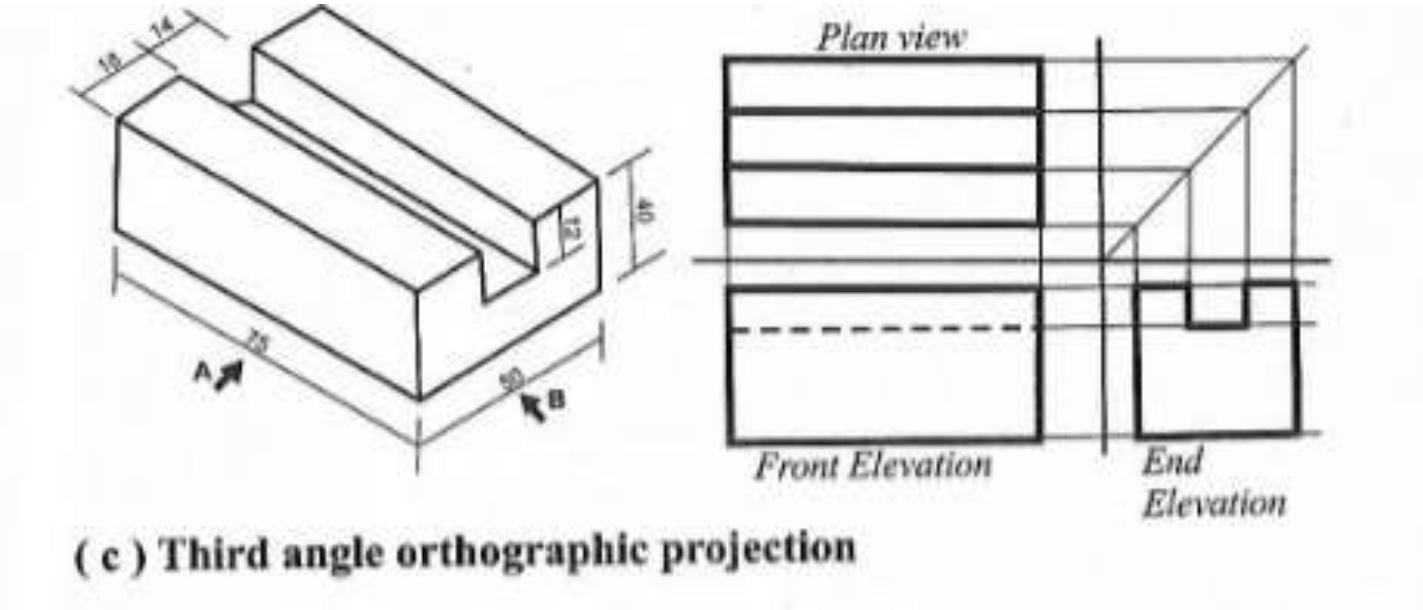
Week Three Topic: Orthographic Drawing
Sub-Topics: Projecting Simple Objects in Third Angle

Examples

Draw the blocks below in third angle or first angle orthographic projection and insert five important dimensions. Taking Front elevation in the direction of arrow "A" and End elevation in the direction of arrow "B".



(a) Third angle orthographic projection with five important dimensions



(c) Third angle orthographic projection

Week Four Topic: Orthographic Drawing
Sub-Topics: Conversion of Orthographic Projection to Isometric Drawing

Introduction: This lesson will help you to learn how to convert the faces of a given object presented in orthographic forms into isometric forms. This is one of the ways by which objects drawn on a paper in the form of orthographic drawing can be converted or assembled into its original shape in 3-dimension. In other words, it is one of the methods used in assembly drawing.

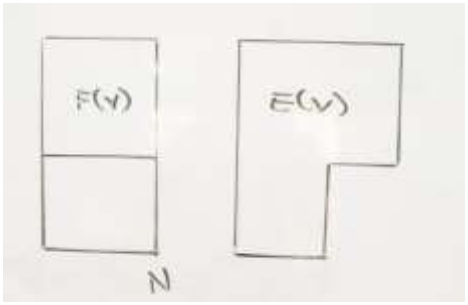
Procedures: The process involved in converting objects in orthographic forms to isometric forms comes in three ways, namely: The **horizontal view**, the **vertical view**, and the **grid line methods**. While we shall present a summarized view of each of these methods in this note, the teacher will conduct a detailed explanation of the steps taken to achieve this task on the board.

Summary Presentation: There are basically two ways by which at least two views of an object are placed if they would be used to assemble an object. This means that at least two faces or views of the object are required to be able to convert an object in orthographic form to isometric. One of the ways of placing the views is by using the **Front View** and its **End View**. In other words, the faces sit side by side to each other so that the **End View** is on the left or on the right side of the **Front View**. The second method uses the **Front View** and the **Plan View**. The **Plan View** can be placed above or below the **Front View**. Given any of these placement arrangements, the work can go on smoothly. We shall now look at how each of these methods goes.

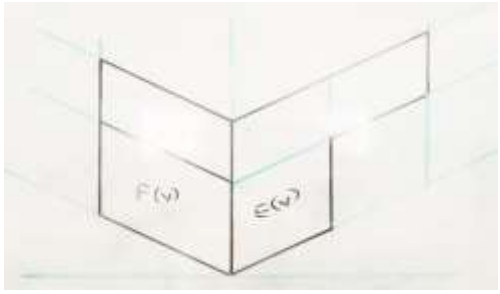
1. Horizontal view method. In this case, the **Front view** and the **End view** are the only faces needed to accomplish the task. That means they are placed side by side to each other. To assemble or to convert the given views into an isometric object, isometric axis is first constructed. The lowest point (which is usually given in each question and indicated by a thickened letter like **X** or **N**) is considered to be the point where the three lines of the isometric axis meet. The **Front View** is drawn first. It is laid on the right side of the vertical axis or to its left. Then the **End View** is placed on the opposite side of the **F(V)**. Once this is completed, anywhere two or more lines meet provides a point where vertical and slant lines (that

go to the right or to the left) are drawn. All the lines drawn from these points must obey the **Principles of parallel lines** and lean at 30^0 to the horizontal except the vertical ones. Since all preliminary constructions must be done in **thin lines**, the faces object in isometric form can then be traced out from the many lines that inter-weave with each other. Study the diagrams below to understand this.

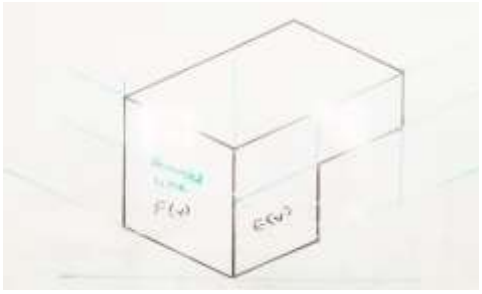
The Axis is drawn first.



The views as given in the question



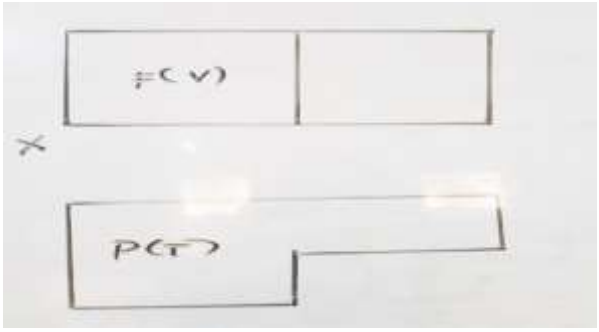
F(V) is placed to ensure **N** is at the lowest point



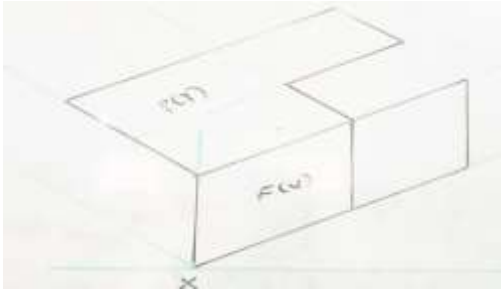
Isometric object is completed

2. Vertical view method. The method used here is the same as the one used in (1) above. The only difference is that the **F(V)** and the **P(T)** are used. The **Plan Top** is placed above or below the **Front View** instead of putting them side by side. Then, the **Plan Top** is used to cover the **Front View**, as if it roofs it. That done, the object can be completed. The diagrams below illustrate this.

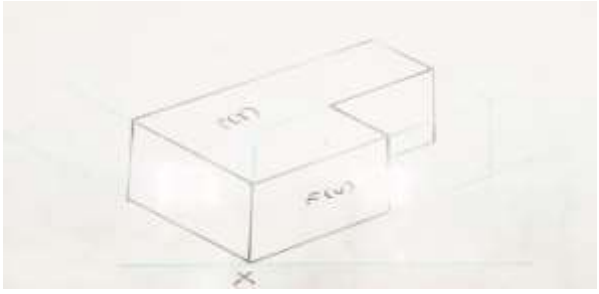
The Axis is drawn first.



The Views as given the questions

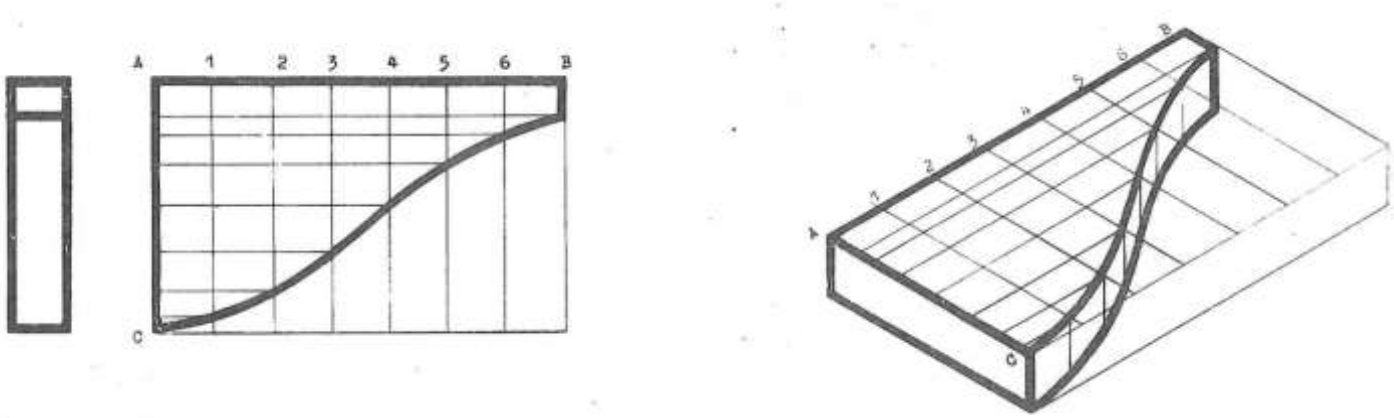


P(T) is used to cover the F(V)



The task is completed and irrelevant lines are erased to show the object

3. Grid line method. In this method, the position of views does not matter. What matters the most is the **total length**, **total height,** and **total width** of the object to be drawn. With these three measurements gotten from the given faces, a cube or a cuboid is drawn in isometric form. Then, the face or view having distortions such as curves, circles, projected or extruded parts and twists are constructed to the dimensions given in the question that is in orthographic form. That same face is divided into grid lines of equal distances apart. These divisions could be in the spaces of 5mm, less or more, depending on the size of the selected view or face. The division is then transfer to its position or face on the cube or cuboid drawn in isometric form. The curves, circles, distortions and twists or offsets are traced out in the cube or cuboid by plotting a locus of the distances of the distorted lines from the 4 main lines that formed the gridded face. This way, the object comes out. See the diagram below for understanding.



Note: The teacher will guide the students through the steps taken to exterude or extend projected parts such as shafts, pipes, tubes etc on how to draw circles and curves in isometric form from Orthoghraphic.

<u>Week Five Topic: Sectioning</u>
<u>Sub-Topics: Sections and Sectional Views</u>

Introduction: This lesson introduces the student to the idea of cutting objects by using cutting tools such as knives, saws, and whatever. In drawing, when an object is said to be sections, it means a cutting tool have been used to cut through it either to separate it into two or to open it up and show some parts hidden away in it. Two terms are used to identify this object that a cutting tool has tempered with. The one is **sections.** This is a term that is used to identify the area, all the areas that the cutting tool affected without including other parts of the object it did not touch. **Sectional view** is the term that is use to represent the whole object when it is presented in 2-dimension. **Sectional view** consists of all the areas the cutting tool affected and the areas it did not affect.

A line is used to show the area on an object that the cutting tool is to cut. **Thin long chain** with thick long dash at its two ends or **thick long chain** is the line type used. The line must have two thick lettered arrow heads that point to the direction the eye would look after the object had been cut through by the cutting tool. The line is normally called **section/cutting plane** or **cutting line**. The diagram below explains all this. Pay attention to the underlined sentence.

7

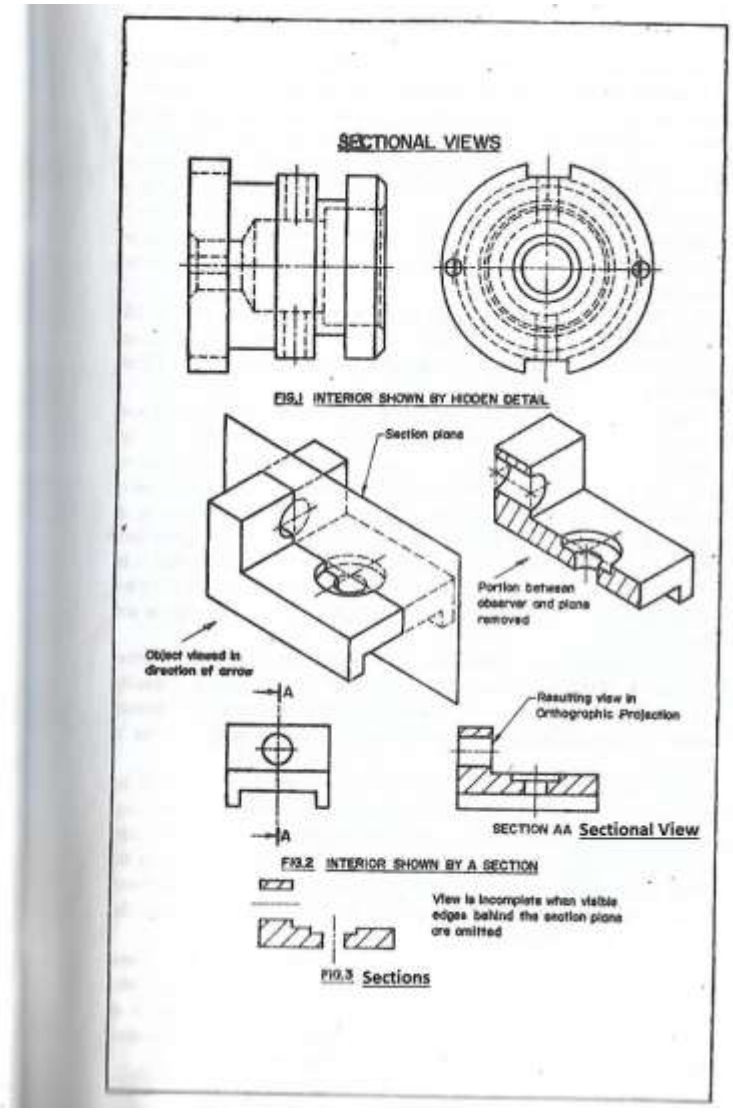
SECTIONAL VIEWS

OBJECTS with little interior detail can be represented satisfactorily in orthographic projection by exterior views, the interior construction being shown by hidden detail lines. When the interior detail is more complicated, as in Figure 1 on page 79, then the hidden detail lines may be confusing and difficult to interpret correctly. In such cases the draughtsman imagines the object to be cut by a plane as in Figure 2, and assumes the part of the object between his eye and the plane to be removed. This exposes the interior detail which can then be shown by full lines instead of hidden detail lines. The resulting view is a sectional view or a section. Strictly a sectional view includes all visible lines behind the section plane, while a section shows only what appears on the cutting plane. A section, as opposed to a sectional view, is rarely used, and frequently the two terms are used indiscriminately.

Full sections

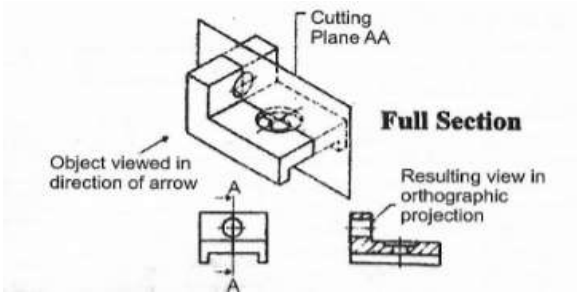
The view shown in Figure 2 is called a full sectional view because the cutting plane passes completely through the object. It should be noted that all visible edges behind the plane must be shown or the view will be incomplete, as illustrated in Figure 3. Such a view is meaningless. Hidden detail lines, however, are not shown on a sectional view unless they are needed to describe the object completely. The position of a cutting plane is shown on a view where it appears as a line, and the direction in which the plane is viewed is given by arrows at each end. Letters on the arrows and a title such as 'Section AA' below the sectional view, relate the view to the cutting plane. The cutting plane line is a long thin chain line with a thick long dash at each end. The arrows are placed with their points touching the centre of this thick dash. Note that the other view or views on the drawing show the complete object, unless they also are sectional views. This is because the object is only imagined to be cut by the section plane. These points are illustrated in Figure 2.

The position of the cutting plane is selected by the draughtsman to show the interior of the object to the best advantage. When its position is obvious, for example when it coincides with the centre line of a symmetrical object, it and the title of the sectional view are often omitted.



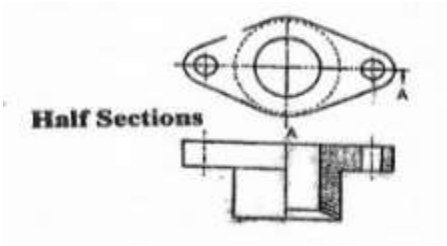
Types of Sectional Views

There are eight types of sectional views used to present objects in a drawing when cutting or breaking is done to them for one reason or the other. What this means is that these are different ways by which technicians present drawings for the purpose of analyzing or studying the inner and outer parts of an object. So, shown and briefly explained below are the eight types of sectional views.



1. **Full Section**: This type of sectional view shows an object that was cut into two equal halves by a cutting plane. In this case, the two halves resemble each other and possess the same property. This diagram explains the point made here.

2. **Half Section:** This is the type of section that presents an object that is cut in such a way that only a quarter, i.e. ¼ part of it is removed to allow some vital inner parts to be seen. The object is assumed to be divided into 4 equal parts. Then, one of those equal parts is cut away just to see something inside the object through that quarter opening. See this in the diagram shown.



3. **Off-set Section:** In this type of section, the cutting tool or plane is turned to include other parts of the object that are required for study but are not in the line of the cutting plane. The turning of the cutting plane as it cuts though the object is done at 90^0. This means that each of the turn that the cutting plane makes in the object is at 90^0. Consider the diagram given.

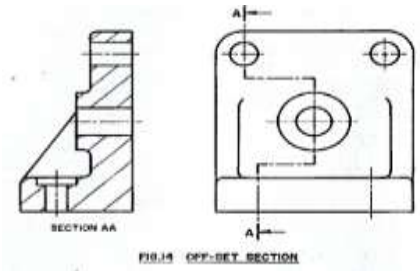


FIG.10 OFF-SET SECTION

4. **Aligned Section:** In this type of sectional view, the turning of the cutting plane inside the object is done at angles greater than or less than 90^0. Then, when presenting the faces that the cutting plane has affected, the area that did not fall on any of the vertical or horizontal axis (or direction) is shown as if the cutting plane actually moved in the horizontal or vertical direction inside the object. But, the sectional view that will be shown will contain the features of the parts that are not on the horizontal or vertical direction. This means that the cut area that shifted away from the vertical or horizontal direction is made to look as if it actually passed through any of the mentioned directions. In other words, the cut area is now made to align with either the horizontal or vertical axis or direction of the object.

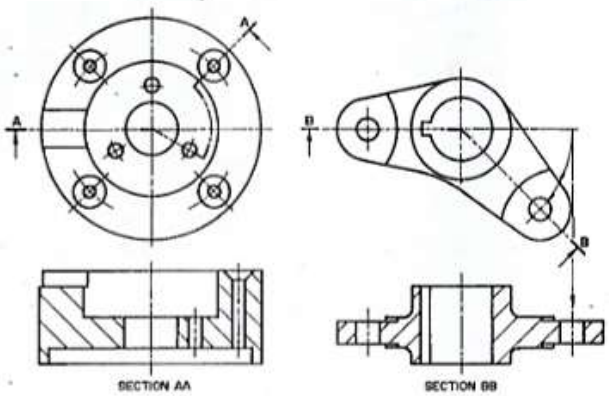


FIG.15 ALIGNED SECTIONS

5. Revolved Section: In this type of sectional view the thickness and shape of shafts and other similar objects are found simply by cutting out a portion of the object. The cutting plane moves in a U-turn. This means that the cutting plane enters the shaft from one side, cuts into it until it reaches the middle of the shaft. Then it is turned to cut along the middle of the shaft by a small distance. The cutting plane is finally turned to cut the object and come out in the same side it entered the object. Look at the diagram given here.

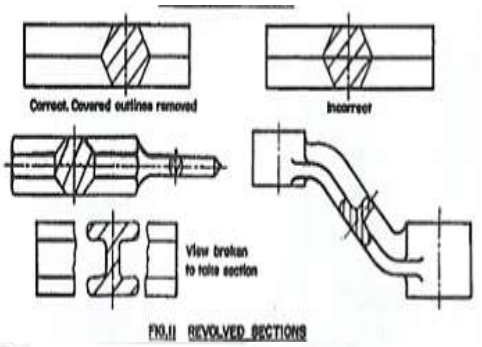


FIG.11 REVOLVED SECTIONS

6. Removed Section: In this type of sectional view, a shaft or an object that must be long is simply cut in different locations across it middle line. This type of cutting is called transverse sectioning. Then, one looks at any of the ends that were cut to see the shape or nature of the shaft. Look the given diagram here.

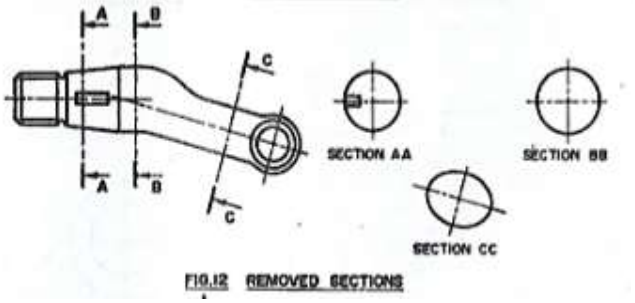


FIG.12 REMOVED SECTIONS

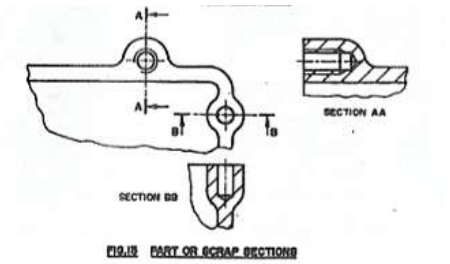
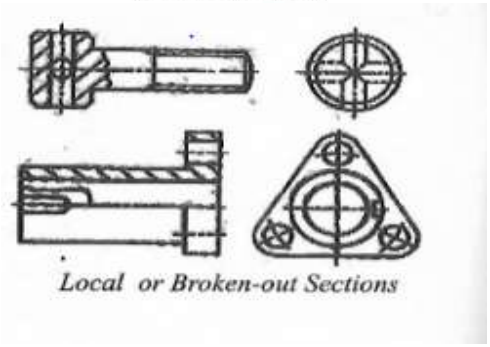


FIG.18 PART OR SCRAP SECTIONS

7. Scrap or Part Section: In this type of sectional view, only a small part of an object, which the eyes cannot see, that the engineer wants to see. And so, he just cut into that part of interest to the depth he wants and then tears off the small part open to see what he wanted to see.

8. Broken-our or Local Section: In this type of sectional view, a part of an object, hiding inside it, can be the item of interest. This part can be the thickness of a hollow shaft, a small hidden member, etc. To see this part, a small portion is cut, while avoiding other parts that may not be too relevant. The cut area that is not wanted is gradually torn away to show the part that is needed.


Local or Broken-out Sections

<u>Week Six Topic: Introduction to Building Drawing</u>
<u>Sub-Topics: Building Drawing.</u>

Introduction
Building drawing is the part of Technical Drawing where students are exposed to some skills used to design simple building plans and present them in manners that are technically acceptable. This lesson is designed to introduce the students to some of the basic things about building technology.

Developing Building Ideas
The idea that will decide the type of building that would be designed is influenced by two things. These are: The purpose of the building and the comfort of its user.

- **Purpose of a building:** There are so many reasons for which buildings are raised. Some of them are agricultural, commercial, residential, educational, governmental, industrial, military, parking and storing, religious, transportation, infrastructural, and power generation purposes, to mention just a few.
- **Comfort of its user:** Houses are designed to give its user comfort, security, serenity, satisfaction, aesthetic tastes, and so on. Whatever beauty that a house possesses is caused by this desire for comfort that is hidden away in the hearts of men. Hence, man builds to please himself.

Steps Taken To Start A Building Plan
After the purpose of a building has been known, to start the process of designing the building plan, certain steps have to be taken. We shall look at this from two fronts: existing design sample and brand new creation.

- **Existing Sample:** People begin by consulting architectural archives for building samples. Many go to the internet to find samples that suit their interests for the structure they wish to erect. Others go round the town to see and snap pictures of building samples they find attractive to them.
- **Brand New Creation:** In this case, the person sits and thinks out the type of building design he wants to build. He sketches the idea that comes to his mind on a paper. He then develops it into a fantastic building plan through the help of an architect or so.

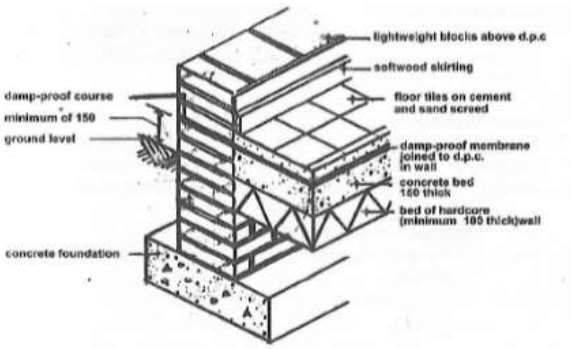
Parts of a Building

To properly treat the topic, we shall look at building parts from three main groups. These are foundation, wall, and roof. Let's now consider these in detail.

1. FOUNDATION

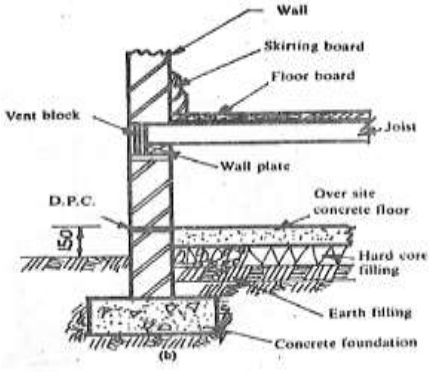
This is the solid structure that is in direct contact with the ground, and on which the whole building is erected. A good foundation has the following parts in it:

- **Foundation footing.** It is the part of the foundation that sits on the ground. It is above it that the building walls are erected. It is made up of stones, cement and sand mixture.
- **Hardcore.** This is the part of the foundation that is made up of big stones which are used to fill the spaces between the foundation trenches. It makes the floor to be very solid and resistant to failure.
- **Concrete slab or bed.** This is the concrete mixture that is made up of gravels mixed with sand and cement. This concrete mixture is used to cover the surface of the hardcore so that is looks leveled.
- **Damp proof course (DPC).** Is a thin layer of water resistance material that is laid above the concrete slab in order to prevent water moisture from reaching the floor surface and damaging it during wet seasons. DPC is made of asphalt, bitumen, polythene membrane (nylon bag), PVC, concrete slate, etc.
- **Sand screed.** This is very soft sand mixed with cement that is used to cover the surface of the DPC before it is covered with either cement paste or floor tiles as floor finish.



A section throughStrip foundation

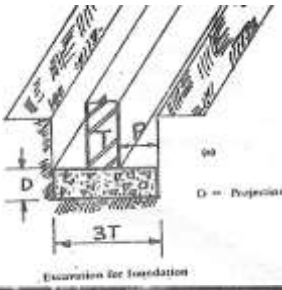
- **Floor joist.** Is the solid horizontal wooden support on which a wooden floor board is laid and held to place by nailing. It is like the beam that supports the roof of a house.
- **Wall plate.** This is a wooden support that is laid on the short block wall that rises from the foundation footing. It is on this wall plate that the floor joist is laid before placing the wooden floor board on them. Wall plate acts like a short absorber to wooden floors.
- **Vent block.** This is an arrangement of some blocks between the block wall from the foundation footing and the main wall of the house. Between these two walls is the wall plate, floor joist and the floor board. This can only be seen in wooden floor and not concrete floor.
- **Skirting board.** This is the line of ceramic bar that is laid round the room at the base of the wall where the floor and the wall meet. It covers all the irregularities that can be seen between the wall and the floor, which is caused by the sand screed that is used to hold the floor tiles in place.



- **Tiles.** This is a ceramic material of any design that is used to give the floor what is known as finish. It is the topmost layer of the floor.
- **Cement paste.** This is the use of cement only to cover the face of the sand screed if floor tile is not to be used. The paste is made by pouring water to the cement dust and stirred to form a liquid paste. The paste is then spread on the floor surface with the help of hand trowel. This type of floor finish is no more popular today. The diagrams here will help you to see these parts better.

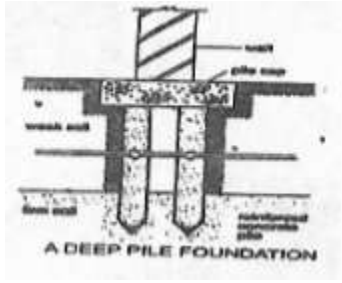
Types Of Foundation

There mainly four types of foundation. They are **strip, raft, pile,** and **pad foundations**. They are briefly explained below.



- ✓ **Strip foundation**. This is a type of foundation whereby continuous concrete mixture is poured inside foundation trenches to form long foundation footing. The height of the concrete forms the footing's thickness inside the foundation trenches. Then, wall is erected on it.

- ✓ **Raft foundation**. In this type of foundation, concrete material is poured from the foundation trenches to the surface of the ground. Then, the concrete layer on the ground surface is continued till it covers the entire surface of the area that the building will stand. It is made stronger by reinforcing it with iron rods.



- ✓ **Pile foundation**. In this type of foundation, square, rectangualr or circular holes are drilled into the ground. Solid concrete blocks or bars are forced into these holes to produce solid support from the stronger part of the soil inside th ground. Then, the pile of these concrete blocks provides the solid support that the floor would need to stand firm on a swarmpy or soft soil surface of ground. The floor is then laid on the top of the pile shafts that are buried inside the ground.
- ✓ **Pad foundation.** This type of foundation is used when buiding a structure that needs not touch the ground. In other words, the foundation is made up of columns of piers, standing on a square, circular, or rectangular footing buried in the ground. Unlike the pile foundation where the floor of the structure touches the ground, in pad foundation, the columns from the buried foundation feet holds the finished structure high above the ground level.

2. WALL

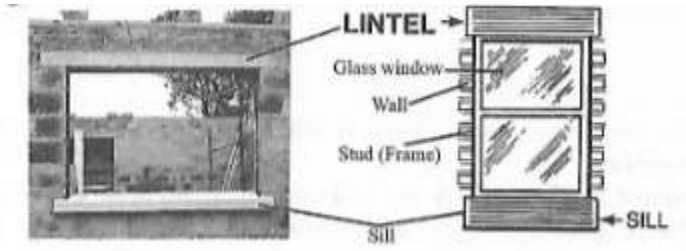
This is the part of a buidling that divides the floor into rooms, provides security, warmth, and privacy to people. There arer two types of walls namely:

- **The load bearing walls**: These carries other loads like the roof, beams and upper floors.
- **Non-load bearing walls**: These are used mainly to divide the floor into rooms.

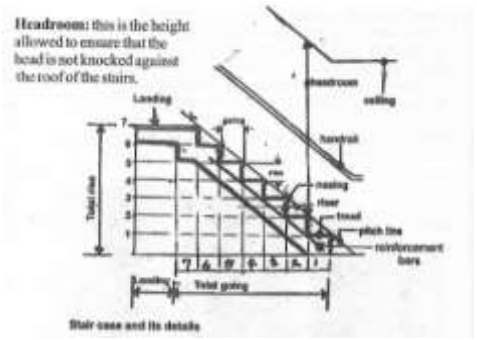
Other parts of the wall are:

- **Bonding.** This is the name given to the arrangement of block in horizontal lines. Each horizonatal line is called a **Course.**The bonding material is called **Mortar** and it is made of a mixture or cement, water and moderate grade sand.
- **Plastering.** Is the process of using morter to cover the inside and outside of the wall to make it look smooth. **Rendering** is made from a mixture of cement, fine sand and water.
- **Rendering.** Is another form of **Plastering**. It is used to cover the faces of walls on the outside alone, when attempting to give the house an aesthetic look.

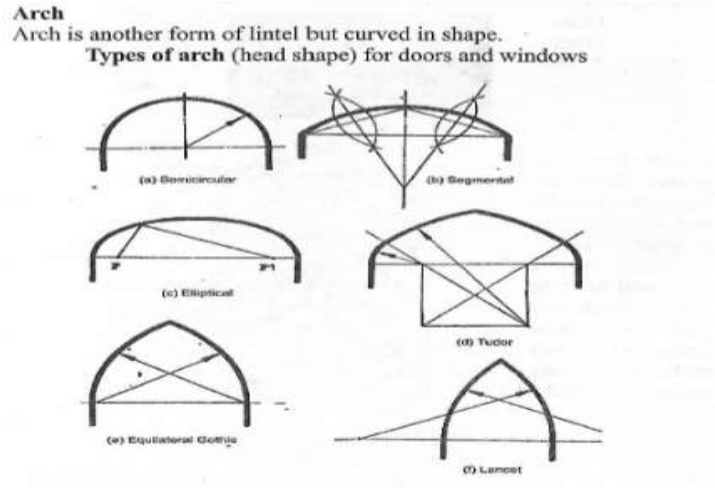
- **Verrandah.** This is a part of floor that extends outside the room. It has a wall on one side and an open space on the other side. The open space can sometime be shield with a **Dwarf wall** or **Balustrade** to serve as protectors in case the verandah is on a raised pavement.
- **Balustrate.** This is a metal or wooden material that is used to add height to **dwarf walls** or **Staircase handrails.** It is usually designed to look attractive to the eyes.
- **Corridor.** It is a passage inside a house that links to other rooms. It is usually bounded on both sides by walls and doors most times.
- **Dwarf wall.** This is a short wall that has three or four **courses** of block lines built in front of a house or verrandah to provide security to people.
- **Door.** This is an opening that allows people to enter and to leave a room or a house. It is also a part of a house where light and ventilation can enter into the house.
- **Widow.** This is an opening on the wall that allows light and ventilation get into a room or a house. The window has other parts such as **Lintel** (the upper frame of the window), **sill** (the lower frame of the window), **Stud or Jamb** (the two vertical frames of the window), **shutter** (the lid used ot shut the window), **Stile** (the middle vertical frame of the window that holds two or more panel windows to place), **Panel** (this is the sheet of wood, metal or glass that is used to craft window and door shutters).



- **Architraves.** This is a **mortar** work that is done around doors and windows to cover the opening between **Jamb** and the wall.
- **Lining.** This is the cutting that is done on **Jamb** or **frame** in order to allow window and door shutters to fit in properly.
- **Pier.** This is a vertical column that is built outside of a wall of building to add support to it.
- **Rebate.** This is a cutting made in a wooden member to allow it receive another wooden member in it.
- **Staircase.** This is structure that provides a path for access upper floors of a building. The different parts of a staircase are shown in the diagram given here.



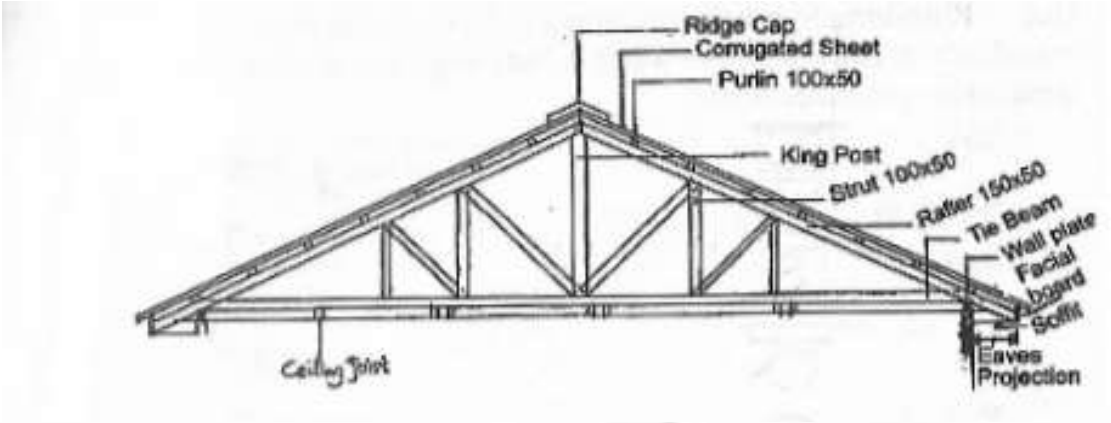
- **Arch.** This is a type of lintel with different artistic designs. Some examples of arch are shown in the given diagram. The names of the different types of arch in the diagram are as follows, beginning from the top left to the bottom right in that order: **semicircular, segmental, elliptical, tudor, equilateral Gothic, and lancet arches.**



- **Columns (Pillars).** These are vertical members build and reinforced that support the roof.
- **Beams.** These horizontal members build and reinforced to support roofs.

3. ROOF

This is the topmost part of a building. The diagram below gives us all the vital parts of a roof and what role they play.



Ridge cap: This covers the joint of the two slanting roofs.
King post: The king post uprights the two rafters and they are nailed to it.
Strut: The subsequent planks parallel to king post and their braces are known as struts. The next plank parallel to king post also called queen post.
Rafter: The two inclined planks that rest on the king post are called rafters.
Tie beam: Tie beam is the horizontal plank meeting the lower part of the two inclined planks (rafters).
Wall plate: This is the plank place round the wall to which the entire roof is attached. The wall plate is also fasten to the wall using metal belt.
Facial board: This is the flat plank that covers the bottom edge of the inclined roof.
Soffit: The external ceiling of the building.
Eaves projection: This is the extension of the roof from the wall externally.
Ceiling joist: These are the short vertical planks attached to the tie-beam and to which the ceiling is nailed.
Purling: These are the horizontal planks to which roofing sheets are nailed.
Pitch angle: This is the angle of inclination of the rafter to the tie beam.

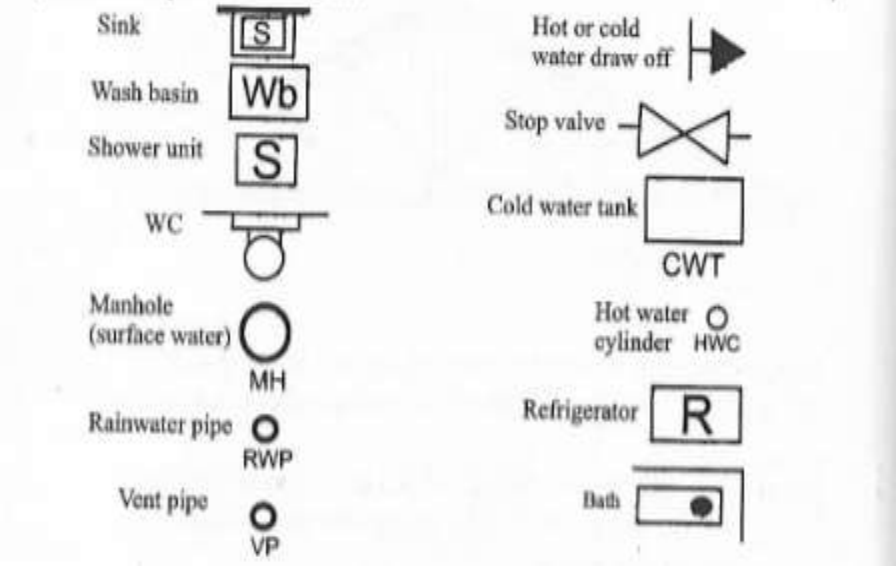
Parappet: This is the part of a roof, which made of blocks. It is built on top of the roof round its edges to hold the roof down and prevents if from ripping off during strong storms.
Ridge: This is a long narrow roofing sheet that is used to cover the highest point on a roof where the roofing sheets meet. It prevents water from entering the roof.
Wall Plate: Is placed on top of the wall to carry the tie **beam.**

Symbols Used In Building Drawing

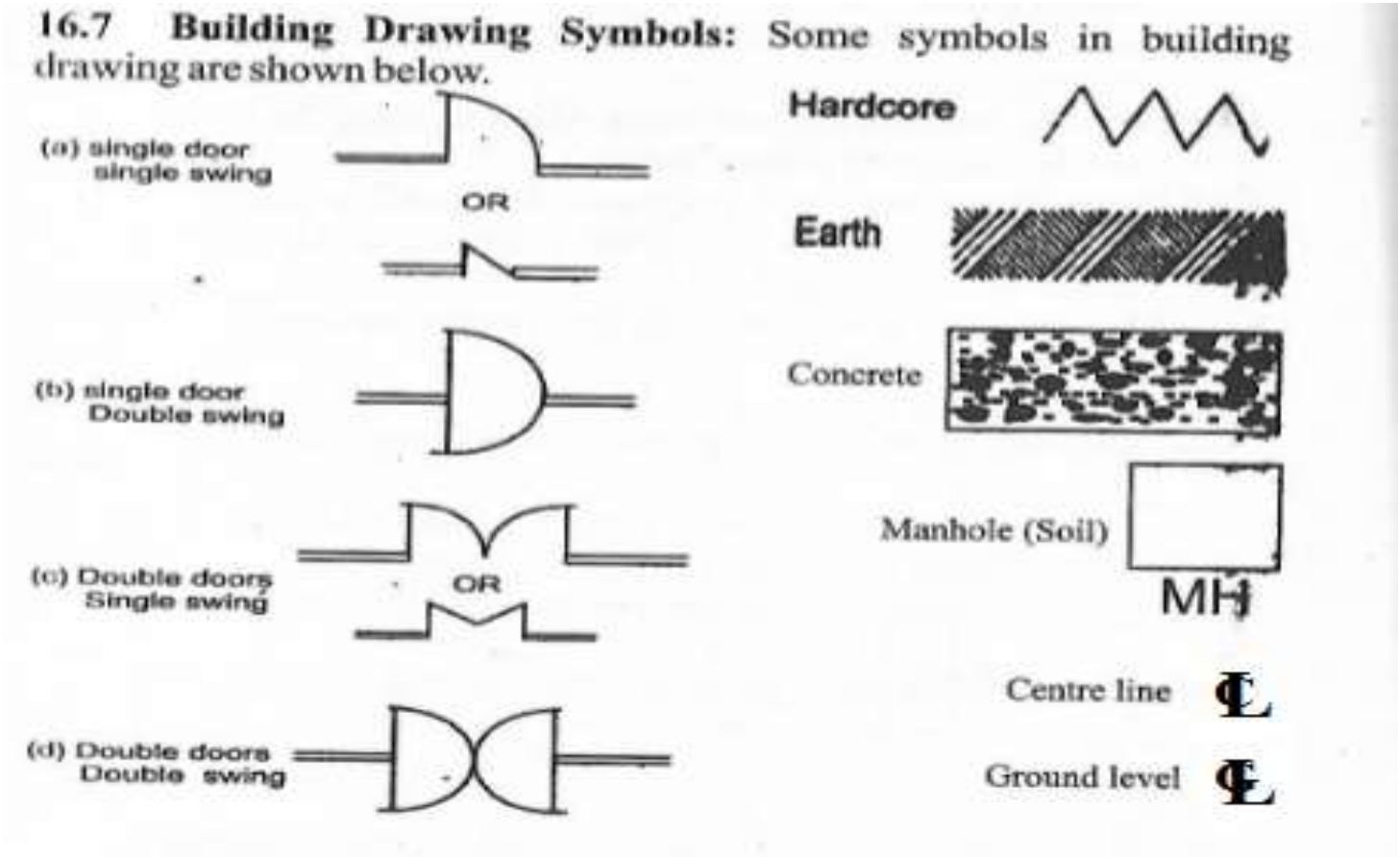
Symbols are the items that engineers use to communiate their ideas through drawing to each other. A proper mastery of these symbols equips the technician to be able to read and interpret all kinds of drawing.

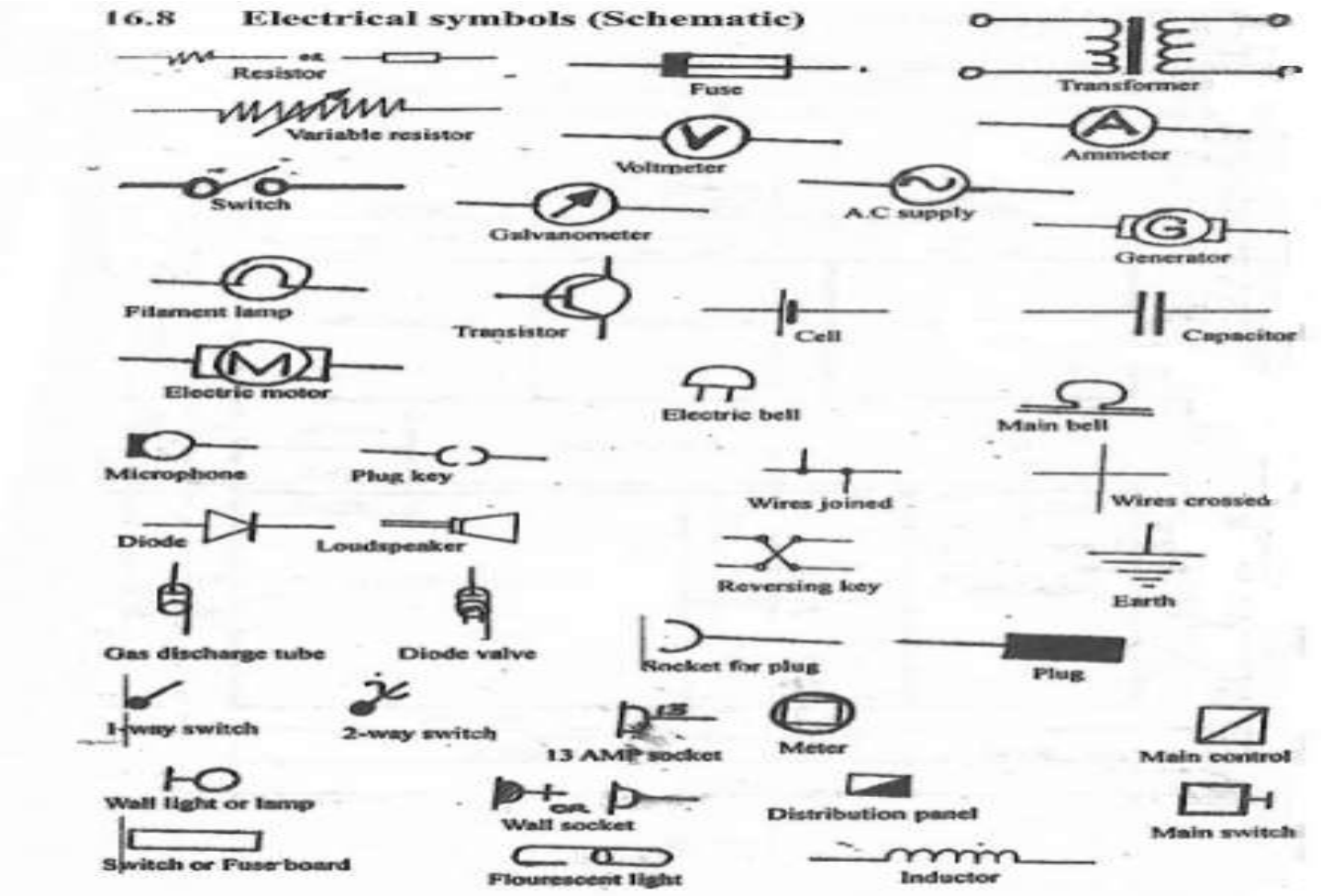
There are symbols that are used to show electrical network in a building and there are those that are used to show plumbing network. Symbols used to show the different parts of the building also exist. Hence, we are now going to familairize ourselves with some of these symbols used in buiding drawing.

16.6 Plumbing Symbols: plumbing is the system of pipe networking in such a way that it supplies water to buildings. Some of the plumbing symbols are presented below.



16.7 Building Drawing Symbols: Some symbols in building drawing are shown below.





Dimensioning of Building Drawing

All the dimensions used in building drawing are in millimeter (mm). Although they are written in hundreds and in thousands of millimeters, to reduced the dimensions to the size of the paper on which the drawing is to be done, a scale is normally given. The dimensions are divided by the scale given and then the resulting answers are divided by 10 to have the dimensions in centimeter, which is the unit we can easily measure with our rulers. As an example, consider the dimension of a room given as: 2250 x 1790. If the given scale is 1: 100, then, to reduce the given dimension, i.e., 2250 x 1790 to the given scale, divide each number there by 100. This will give you: 22.5mm x 17.90mm. To then convert this reduced dimension to centimeter for easier placement on a paper, divide them again by 10, as 1cm = 10mm. That way, you will have: 2.25cm x 1.79cm, approximated as 2.3cm x 1.8cm. You can now use this dimension to draw the room on your paper with the aid of your ruler and other drawing tools.

This conversion can only take place when dealing with lenghts. It does not affect angles. So, take note of that.

Again, 2250 x 1790 means the length of the room is 2250mm and the breadth of the room is 1790mm. But when you have three dimensions given such as this: 225 x 150 x 90, it means the part is 225mm long (length), 150mm wide (breadth), and 90mm thick (deep or high). This dimensioning method is only

applicable to countries that use British (Metric) system of measurement. Americans use inches and so forth.

Week Seven Topic: Introduction to Building Drawing
Sub-Topics: Building Parts and Types.

Introduction In this lesson, we are going to identify all the types of building, doors, windows and roofs.

'Types of Building

There are so many types of building that man has invented over the years. Altough we have discussed the purposes of a building, those ones are not the same as the types of building. An agricultural building, for instance, can be designed to take the form of any of the types of building we shall present here now. And, let's see the various types of building man ever build.

1. **Caves**. This was the type of house that man used during the Stone Age. Man lived in caves and among trees.
2. **Farm house**. This is small type of house that is built in the farm mainly for resting after a hot day's labour. It is usually made of grasses, tree branches and Zinc.
3. **Thatched house.** This type of house is made from elephant grasses and they are commonly found in village areas, hamlets and remote settings.
4. **Mud house.** This type of house is made from kneaded or mud mixed with tinder or dry grasses. This house type is usually found in village, hamlets, towns, and even in some recreational areas in the city.
5. **Pre-fabricated house.** This type of house is built from destructible materials such as zinc, timber logs, plywoods, and metal sheets.
6. **Stone-walled house.** This type of house is built by using stones specially cut for that purpose.
7. **Brick/block house.** This type of house is built from blocks and bricks. It comes in various categories, some of which are mentioned below:
   i. **Bungalow**. Any house built of bricks or blocks that has only two floor – ground and first floors. It is usually not a massive house.
   ii. **Storey building**. This is a house type that has at least one ground floor with up to ten floors above the ground floor. A storey building has a maximum number of eleven floors altogether.
   iii. **Skyscraper**. This is the type of house that has one ground floor and up to twenty upper floors.
   iv. **High-risers**. This is a type of house that has infinite number of floors above the ground floor. The two Towers of World Trade Center is an example of high-risers.

Forms of Building
Buildings are given names based on the ways they are arranged along with other houses or their design pattern. Hence, we have the following ways of arranging house in town, cities and suburb areas:

1. **Detached building**. This is a form of building whose walls and roofs are independent of other buildings around it. It means the house is standing alone either in the midst of many other buildings or in an open field. It does not share any of its part with any other building.
2. **Semi-detached building.** This is a form of building where two houses share the same fence together. This means that two family houses are separate house but they share one fence together.

3. **Terraced building.** This is a form of building such that so many separate houses are joined to each other by fences, front and rear walls. They normally form a long row of buildings arranged to form even a **street, crescent or close**.
4. **Semi terraced building.** Is a form of house where two houses are built inside one house. But each of them are separated from the other by a wall and not a fence.
5. **Cottage building.** This is a form of small building found normally in rural areas. It can be a one or two storey building. But it is known for being surrounded by gardens.
6. **Duplex.** This is another form of semi terraced building. The difference between the two is that duplex is limited to only one storey building, while semi terraced building can be a bungalow or have more than one storey building.
7. **End-of-Terrace building**. This is the last house on a row of building that formed a terraced building.
8. **Flats building**. This is a form of building that is mainly designed for single persons. It is a bungalow with less number of rooms and a spacious parlour.
9. **Mansion and conservation building**. This is a form of building that is built for ego and pleasure. It is usually very massive, filled with many rooms and luxury features meant to give comfort to the user. It sometimes stands on its own, away from overcrowded areas.

Types of Window

Window has been defined as the opening on the wall that allows light and fresh air to enter the building and circulate inside it. The following list gives us the types of window we have: **louvre window, sliding window, panel window, and the more decorative type like bull's eye window, semi-circular head window, cant bay window, dormer window, double glazed dormer window, and casement window.**

Assignment: Download and submit all these types of window mentioned.

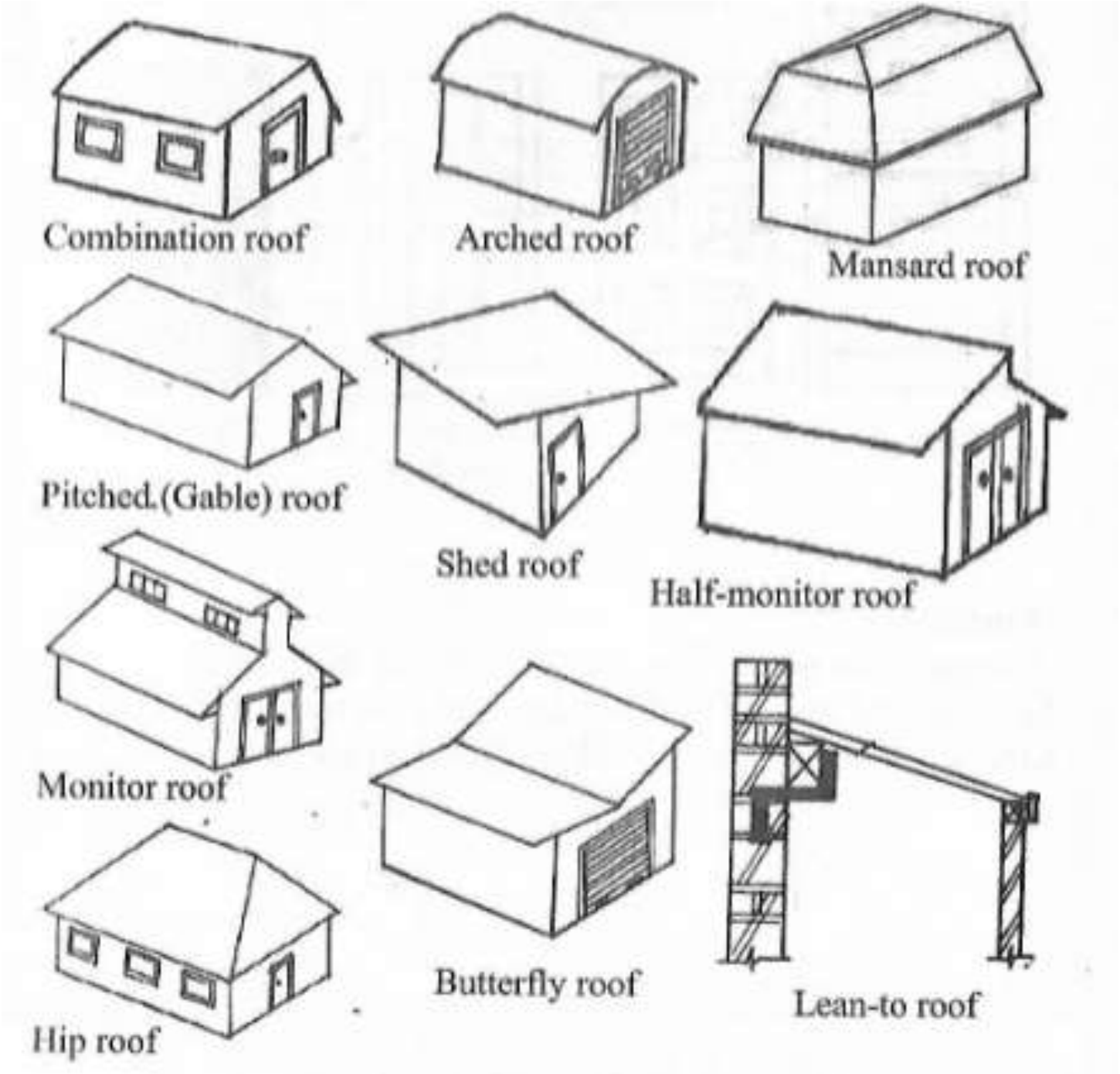
Types of Door

The types of door we have are as follows: **Interior door** (which comprises of the followind door types – **panel door, flush door, French door and louvre door**); **exterior door** (which include the ones listed for interior door); **folding door** (for wharehouse and stores); and **revovling door** (normally found in public places like Malls, stadium, subway, etc).

Assignment: Download and submit all these type of door listed.

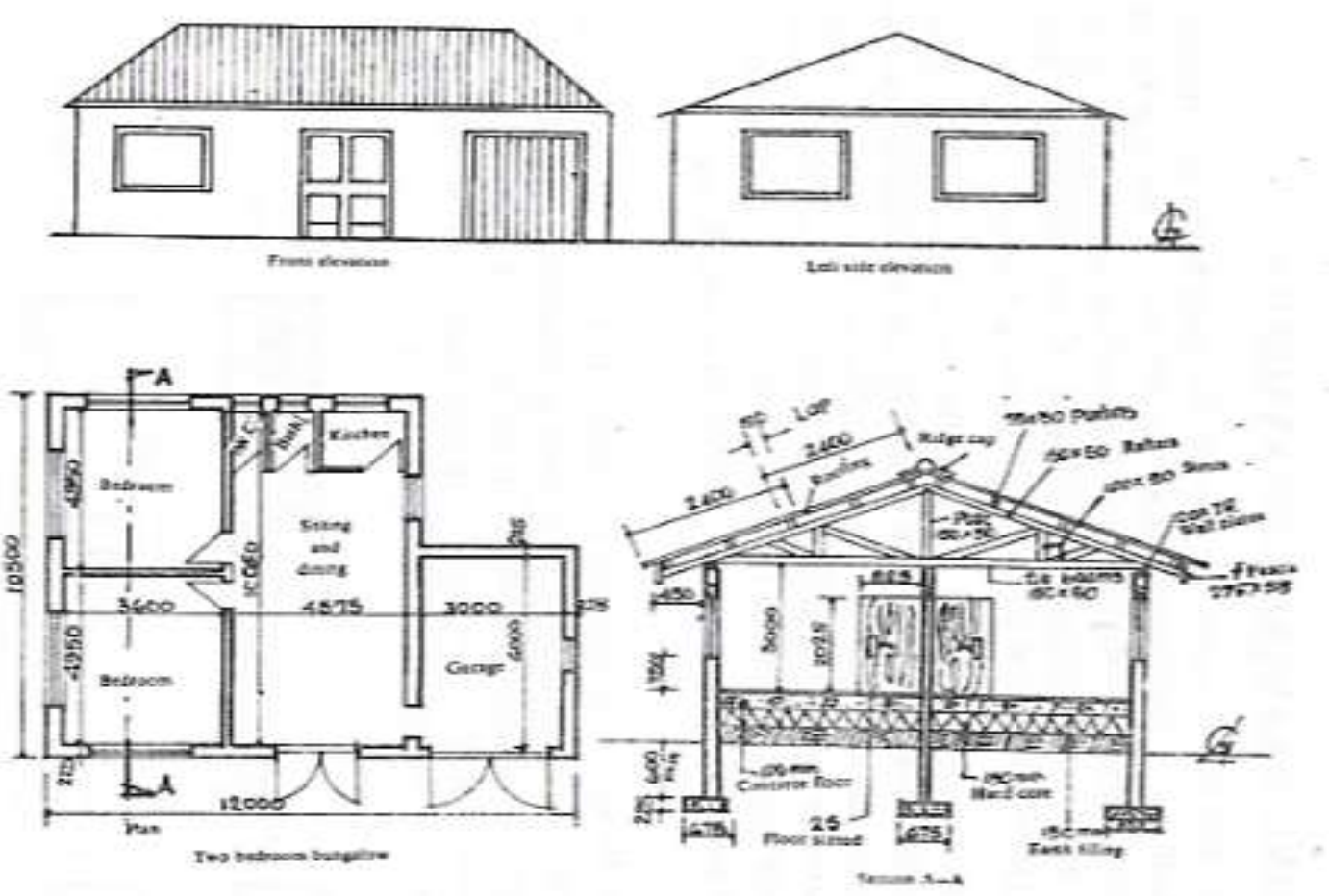
Types of Roof

The diagram below presents to us the different types of roof that we have. Take your time to master them.



Week Eight Topic: Introduction to Building Drawing
Sub-Topics: Presenting A Simple Building Plan In Orthographic Form

Introduction
From this point on, we would learn how to construct building plans, beginning with very simple case of one bedroom apartment. We will use it to learn how to draw the **Plan**, the **End View** and the **Front View**. Normally, the **Plan** comes first, followed by the **Front View**. Then the **End View** comes last.



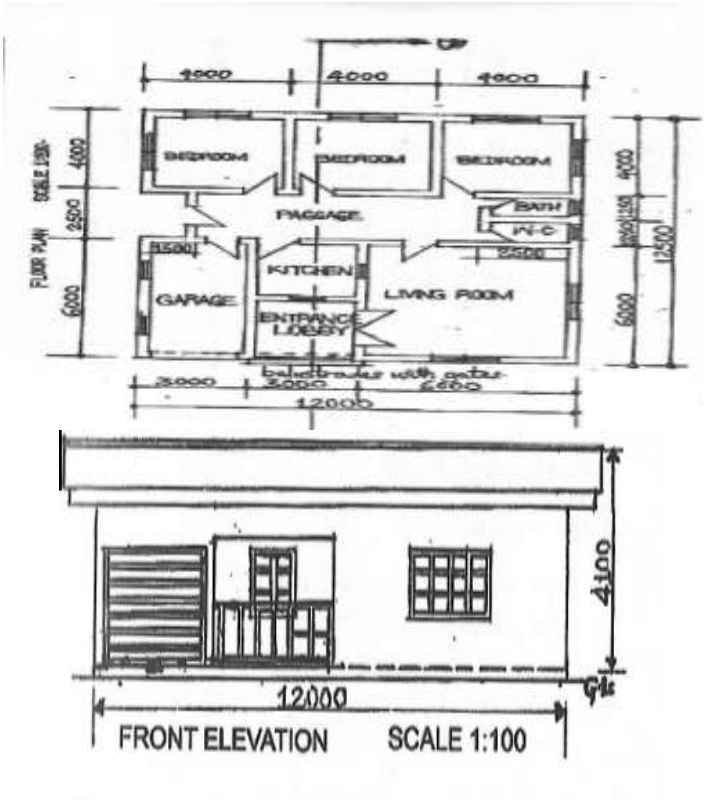
Note:

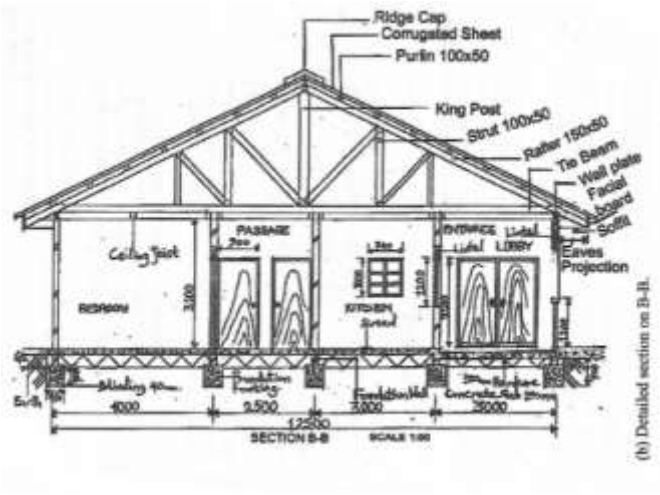
- The teacher will explain what the vies above mean and how they are derived.
- For beginers like us, the plan is usally drawn by using only single thick lines. When we master the art of placing the views properly, we can proceed to learn how to present the **Plan** in the manner shown shown above.

<u>Week Eight Topic: Introduction to Building Drawing</u>
<u>Sub-Topics: Presenting A Compound Building Plan In Orthographic Form</u>

Introduction

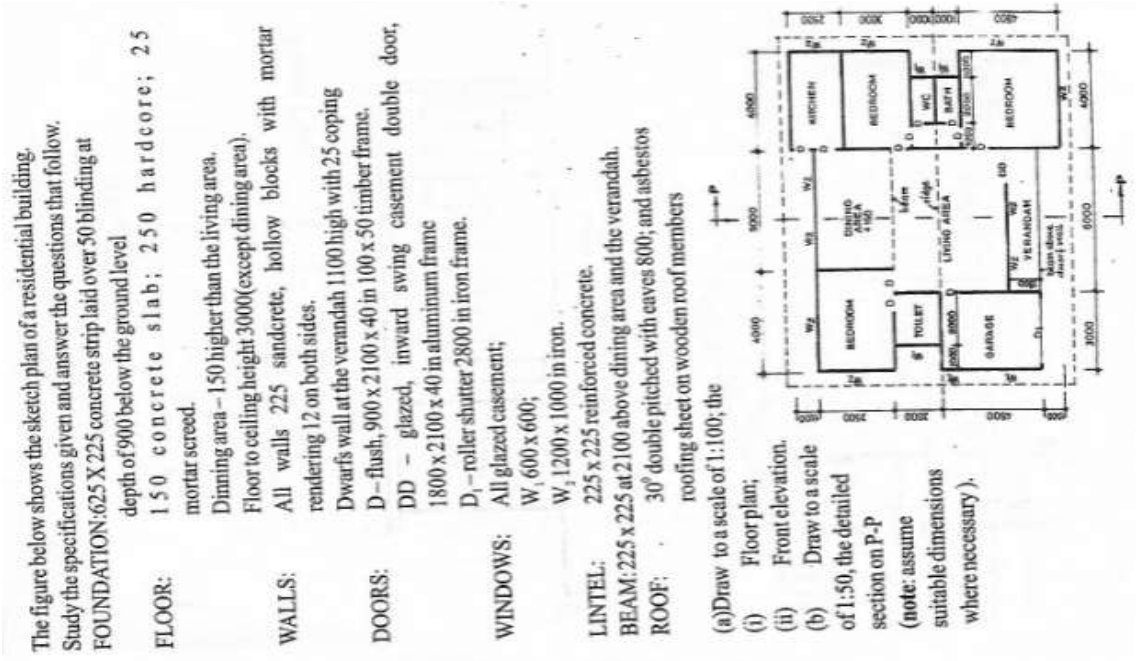
It is now time to practice with more challenging questions. Let's learn how to interpret the various parts of the building given in the questions below. That will help us know where each part will be and how to construct them.





Note: Refer to the text book for more example problems.

Week Nine Topic: Introduction to Building Drawing
Sub-Topics: Presenting A Compound Building Plan In Orthographic Form
More example is presented below:



The figure below shows the sketch plan of a residential building.
Study the specifications given and answer the questions that follow.

FOUNDATION: 625 X 225 concrete strip laid over 50 blinding at depth of 900 below the ground level

FLOOR: 150 concrete slab; 250 hardcore; 25 mortar screed.
Dinning area – 150 higher than the living area.
Floor to ceiling height 3000(except dining area).

WALLS: All walls 225 sandcrete, hollow blocks with mortar rendering 12 on both sides.
Dwarfs wall at the verandah 1100 high with 25 coping

DOORS: D – flush, 900 x 2100 x 40 in 100 x 50 timber frame.
DD – glazed, inward swing casement double door, 1800 x 2100 x 40 in aluminum frame
D_1 – roller shutter 2800 in iron frame.

WINDOWS: All glazed casement;
W_1 600 x 600;
W_2 1200 x 1000 in iron.

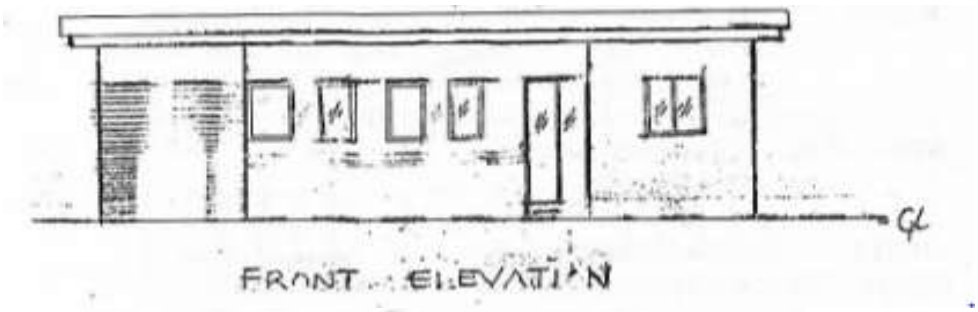
LINTEL: 225 x 225 reinforced concrete.

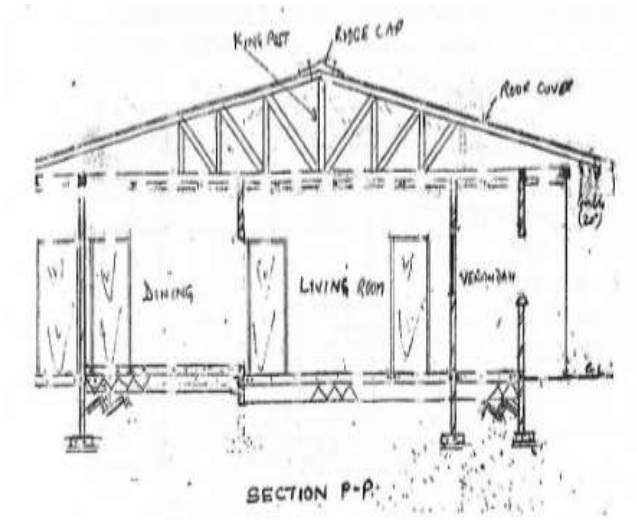
BEAM: 225 x 225 at 2100 above dining area and the verandah.

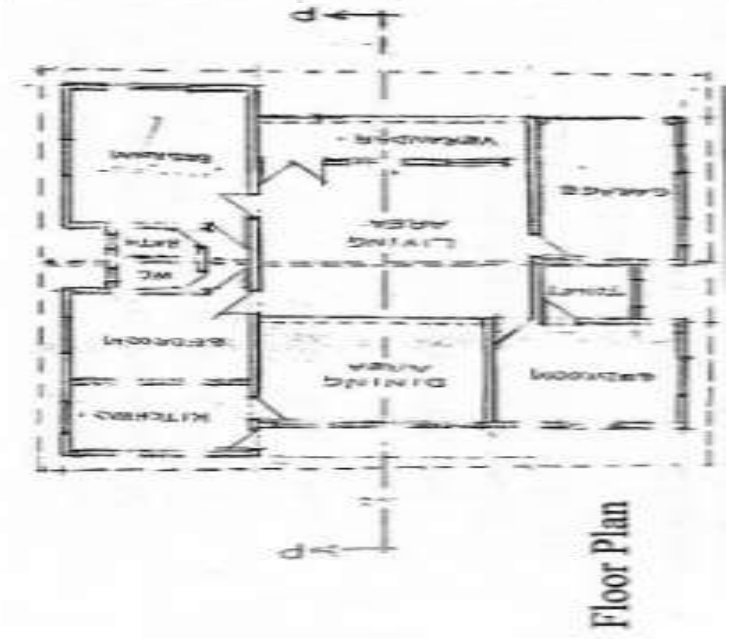
ROOF: 30° double pitched with eaves 800; and asbestos roofing sheet on wooden roof members

(a) Draw to a scale of 1:100; the
(i) Floor plan;
(ii) Front elevation.
(b) Draw to a scale of 1:50, the detailed section on P-P
(**note**: assume suitable dimensions where necessary).

Solution:







<u>Week Ten Topic: Introduction to Building Drawing</u>
<u>Sub-Topics: Presenting A Compound Building Plan In Orthographic Form</u>

The teacher takes some problems from the text books test students' mastery of the drawing task.